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If the mounting surface is irregular or non-metal (e.g. fiberglass), the tag must be attached to a metal backplate to provide an electrical reflector for the tag. A 1/8" or thicker smooth metal backplate extending from each side of the tag should be used.

Tags shall be mounted so as to maximize readability. The "Clear Zone" (See Figures 3 and 4) surrounding the tag and toward the wayside must not be obstructed by any metallic object(s) or protrusion(s). Any obstructions in the "Clear Zone" may introduce reading problems with the tag.

Where possible, tags should be mounted in locations to minimize the likelihood of damage from equipment such as forklifts, piggypackers, and other hazards.

Application of transponders by use of tape, adhesive or similiar materials is prohibited.

**9.1.1 Request for Tag Placement Variances**

Equipment owners who cannot reasonably place the tags within the limits of the specified tag location window described in this Standard must send a written request for a variance to the Director, Freight Car Construction and Components, Mechanical Division, Association of American Railroads, 50 F Street, N.W., Washington, DC 20001 (Fax 202-639-2930).

The request must include the following documentation explaining why the variance is necessary:

- o List of the equipment initial and numbers (or series) affected.
- o Name of the car builder
- o Model of the equipment
- o Cover letter including explanation of why the tags cannot reasonably be placed inside the specified location window and description of proposed alternative location.
- o Diagrams, drawings, and photographs to the extent necessary to show why the tags cannot reasonably be placed inside the specified location window.
- o Explanation, diagrams, drawings, and photographs to the extent necessary to show how the tags would be placed in the proposed alternative location.

A response to each request will be provided. Exemptions that have been granted will be published in Section 9.8 of this document or by Mechanical Division Circular Letter.

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**9.1.2**

The Specification for Application of Automatic Equipment Identification Transponders on Freight Cars, S-917, is incorporated by reference.

**9.2 Railcars and Locomotives**

Each railcar and locomotive shall carry two tags. On railcars, one tag shall be located in a window on the BL (B End-Left) portion and the other shall be located in a window on the AR (A End-Right). On locomotives, one shall be located in a window on the Front-Right (F End-Right) portion and the other in a window on the Rear-Left (R End-Left) portion.

For articulated cars, each car shall carry at least two tags. Optionally, two tags may be placed on each platform. In that case, for the purpose of tag installation, the B end of each platform (other than the B platform) shall be considered as that end of the platform that is closer to the B platform.

The tags shall be positioned as follows:

1. All tags must be placed between 4 feet and 5 feet 4 inches from the centerline of the track. The tags must be 2 to 5 feet above top of rail, measured for an empty car. Adjust for spring travel on a loaded car.
2. For railcars, from the centerline of the truck, 1'-6" (eighteen inches) towards the outboard end of the car to two feet towards the center of the car measured from the centerline of the inside axle. This provision applies to two axle trucks, as well as trucks of more than and less than two axles - See diagrams, Exhibit A.
3. For locomotives, from the centerline of the truck to two feet towards the center of the locomotive measured from the centerline of the inside axle. This provision applies to two axle trucks as well as trucks of more than two axles - See diagrams, Exhibit A.
4. Tags shall be mounted on a plane perpendicular to the ground and shall be oriented with horizontal polarization (with long axis parallel to the rail). The tag shall not protrude beyond the clearance profile of the vehicle to which it is attached.

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For tank cars, it is recommended that the tags not be attached to the tank itself, except as may be permitted by the AAR Manual of Standards and Recommended Practices.

For Roadrailer-type vehicles with integral rail wheels (e.g. Mark IV) should be treated and tagged as both cars and trailers. Vehicles without rail wheels (e.g. Mark V) should be tagged as trailers or chassis, and the rail trucks for those vehicles should be tagged as rail cars. It is recommended that for the rail trucks, BL and AR tags be placed on the sign boards, if available.

Tags on railcars and locomotives shall perform according to the specifications in Section 6 for beam powered tags.

### **9.3 End-Of-Train Devices**

Each end-of-train device shall be affixed with one tag, on a side of the device to be determined by the owner. At the owner's option, two tags may be used, with one tag on each side of the device.

The tags shall be mounted such that they will respond to a horizontally polarized interrogating signal (long axis parallel to the rail).

It is recommended that tags with performance equivalent to that of a battery tag as described in Section 6 be used in this application.

### **9.4 Containers**

For containers 40 feet in length or less, the equipment tag shall be located on the forward right sidewall of the container, approximately one foot to the rear of the front corner post within the first corrugation (if applicable), centered one foot below the roof line of the vehicle [See Exhibit B]. For installation on equipment without sidewalls [e.g., tanks, platforms, and rack configurations], the tag may be located on or adjacent to the right front corner post, facing outward towards the right side of the vehicle.

For containers that exceed 40 feet in length, the tag must be adjacent to the rearward side of the post at the forward 40-foot corner lock position [See Exhibit C].

Tag shall be mounted such that it will respond to a vertically polarized interrogating signal.

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Tags with performance equivalent to that of a battery tag described in Section 6 shall be used for this application.

### **9.5 Chassis**

The equipment tag shall be located on the right hand front corner of the forward bolster. Tag will be oriented in a forward direction. [See Exhibit D]. The tag shall be mounted such that it will respond to a horizontally polarized interrogating signal.

Tags with performance equivalent to that of a battery tag described in Section 6 shall be used for this application.

### **9.6 Trailers**

When possible, the tag shall be located on the forward right sidewall of the trailer approximately 1 foot to the rear of the front of the trailer, centered 1 foot below the roof line [See Exhibit E]. When in this location, trailer tags shall be mounted such that they will respond to a vertically polarized interrogating signal.

For trailers, such as flatbeds, where the above recommended location is not available or feasible, an alternate location shall be utilized. For these trailers, the tag shall be located on the front surface of the trailer on the right side. These tags shall be located in a placement window which extends horizontally from the trailer's right side to a line two feet towards the center of the trailer, and which extends vertically from the bottom surface of the trailer to a line 1 foot above the bottom surface [See Exhibit E].

When in this alternate front location, trailer tags shall be mounted such that they will respond to a horizontally polarized interrogating signal.

Tags with performance equivalent to that of a battery tag described in Section 6 shall be used for this application.

### **9.7 Tag Attachment Recommendations**

While not required by this Standard, the following procedures are provided as guidance to assist in tag installation. For railcars, Tag attachment requirements are specified in S-917.

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**9.7.1 For rivet mounting:**

Pop rivets of a type compatible with the car structure and with a proper grip range such as:

SD66BSLF Grip Range 1/4" to 3/8"

SD68BSLF Grip Range 3/8" to 1/2"

SD610BSLF Grip Range 1/2" to 5/8"

SD612BSLF Grip Range 5/8" to 3/4"

Two washers per tag (optional dependent upon type of fastener used).

Using appropriate pop rivets, attach the tag to a bracket or metal mounting surface. High pressure rivets are not recommended.

**9.7.2 Mounting with Bolts or Threaded Securements:**

Extreme caution must be used if tags are attached with bolts or threaded connections. Nuts should be torqued to no more than 30 in.-lbs to prevent damage to tags. If excessive torque is applied, the tag case may crack or break.

**9.8 Variances to Standard Tag Placement Window**

**Equipment Affected**

**Tag May Be Placed**

9.8.1 DTTX 64000 and 74000  
series double stack cars

Longitudinally: As much as 4 feet towards the  
center of the car, measured from  
the centerline of the inside axle.

**10.0 APPROVAL REQUIREMENTS**

**10.1 Approval of Tags**

All new tag designs and changes to existing tag design must be approved by the Car Engineering Committee, Mechanical Division and shall be identified by type. The approval shall remain in effect as long as no changes are made in the tags or in the specification requirements.

**10.2 Facility Certification**

As a minimum, all tags must be manufactured in a facility certified as meeting or exceeding AAR quality assurance Specification M-1003. ISO 9001-Quality Systems-Model for quality assurance in design/development, production, installation and servicing has been determined to exceed M-1003 specification requirements.

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**10.3 Design or Manufacturing Changes**

**10.3.1**

If a manufacturer desires to make any changes in an AAR approved tag, he shall advise the Director-Freight Car Construction and Components, providing full information as to the nature of the proposed change and the reason for the change. If a new issue of a drawing or specification is made for the purpose of clarifying or correcting it, notice shall also be provided. The Car Engineering Committee will decide in each case what action is to be taken on these changes and, in the event they are approved, the appropriate documentation describing the change e.g., drawing(s) and specification will be included with the approval record.

**10.3.2**

If changes are made in the specification, the Car Engineering Committee will take the necessary action to determine whether approved tags conform to the changed specification.

**10.3.3**

A manufacturer shall furnish to each purchaser of tags covered by AAR approval a guarantee that the tags furnished are the same as those covered by the approval.

**10.3.4**

Configuration of tags shall be controlled in accordance with Mil Std 481 latest revision.

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**Appendix A**  
**TAG DATA FOR THE RAILCAR**

**1.0 BITS AVAILABLE FOR GENERAL USE**

Fields specified by the Standard are listed in Table A: General Use fields are indicated in bold type. A description of each General Use field is presented in the paragraphs following Table A.

**Table A: Data Field Descriptions for the Railcar Tag**

<b>Entry</b>	<b>Bits Required</b>	<b>Tag Data Sequence</b>	<b>Minimum Value</b>	<b>Maximum Value</b>	<b>Units</b>
Equipment Group Code	5	0-4	0	31	Type Code
Tag Type	2	5-6	1	4	Type Code
Equipment Initial (Mark)	19	7-25	A	ZZZZ	Alpha
Car Number	20	26-45	0	999999	Numeric
Side Indicator Code	1	46	0	1	Side Code
Length	12	94-96,*	0	4095	Decimeters
		47-55	[0	1343	Feet]
Number of Axles	5	56-59,64	1	32	Axles
First Check Sum	2	60-61			
Reserved Frame Marker	2	62-63			
Bearing Type Code	3	65-67	0	7	Type Code
Platform Identifier Code	4	68-71	0	15	Platform Code
Spare #1	5	72-76	Available for Owner's Use or 1st Position AAR Car Type		
Spare #2	10	77-86	Available for Owner's Use Or Last 3 Positions AAR Car Type		
Spare #3	7	87-93	Available for Owner's Use		
Reserved	9	97-105	Reserved for Future Use By AAR Reserved for Security or limited Owner's use		
Security	12	106-117			
Data Format Code	6	118-123			
Second Check Sum	2	124-125			
Frame Marker	2	126-127			

\* Bit order shall be 94, 95, 96, 47, 48 ... 55.

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The fields are arranged in a hierarchical fashion in order to expedite processing by the data processor. It is intended that the data processor will first look at the Data Format Code to determine if the tag should be ignored. For example, in some cases the data processor will wish to ignore all tags except those specified as rail (AAR Standard) or marine intermodal (ISO Standard) tags.

Once the Data Format Code has been processed, then the data processor will look to the Tag Type to determine the configuration, capabilities, and memory capacity of the tag.

Next, the data processor will examine the Equipment Group Code to determine if the tagged equipment is relevant. For example, the host may want to ignore or process differently, non-revenue equipment than it would locomotives or railcars.

The order in which the remaining fields are processed will be dictated by the particular application.

### **1.1 Equipment Group Code**

This is a numeric field having a value from 0 to 31 that indicates the general type of equipment. A table of values for this field is indicated below. Note that only major categories of equipment types are indicated in this field and other fields are allotted to indicate further details. The Equipment Group Code for a railcar is decimal 19 (binary 10011).

**Table B: Data Values for the Equipment Group Code**

<u>Value</u>	<u>Description</u>	<u>Value</u>	<u>Description</u>
0	Other	16	Reserved
1	Reserved	17	Tractor (Power)
2	Reserved	18	Straight Truck
3	Reserved	19	Railcar
4	Reserved	20	Dolly
5	Locomotive	21	Trailer
6	End-of-Train Device	22	Reserved
7	Reserved	23	Reserved
8	Reserved	24	Reserved
9	Reserved	25	Reserved
10	Intermodal Container	26	Reserved
11	Reserved	27	Chassis
12	Reserved	28	Reserved
13	Reserved	29	Reserved
14	Non-Revenue Rail	30	Reserved
15	Reserved	31	Reserved



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**1.2 Tag Type**

The Tag Type indicates the configuration, capability, and memory size of the Tag, as indicated in Table C.

**Table C: Data Values for the Tag Type Field**

<u>Decimal Value</u>	<u>Description</u>
1	Reserved
2	Tag described by this AAR Standard and the ISO Standard 10374
3	Multiple Frame Tag
4	Reserved

To code the Tag Type value into the tag, the decimal value is reduced by one and converted to its base 2 equivalent.

**1.3 Equipment Initial**

The Equipment Initial is composed of four (4) letters and can be represented as C1; C2; C3; C4. To code this information in the tag, the possible letters represented by C1 will be assigned to the following decimal values: A=0, B=1, C=2, ...Z=25. The letters C2, C3 and C4 will be assigned the following values: Blank =0, A=1, B=2, ...Z=26. This code assignment allows for an Initial of less than four characters, with the actual characters left justified, and the remainder of the field padded with blanks.

Conversion from alpha to numeric would involve the following:

1. Determine the numeric equivalent of characters C1 through C4. This will result in four numeric values; N1 through N4.
2. Convert N1 through N4 into one numeric value by using the formula:

$$\text{Value} = (N1 \times 27^3) + (N2 \times 27^2) + (N3 \times 27) + N4$$

The base 2 equivalent of the decimal number "Value" is stored in the tag's Equipment Initial field.

Conversion from a base 2 tag format back to the four letters would involve the following, where "Value" is the decimal equivalent of the base 2 value in the Equipment Initial field.

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1.  $N1 = \text{Value} / 27^3$  (integer - drop fractions)
2.  $N2 = (\text{Value} - (N1 \times 27^3)) / 27^2$  (integer)
3.  $N3 = (\text{Value} - ((N1 \times 27^3) + (N2 \times 27^2))) / 27$  (integer)
4.  $N4 = \text{Value} - ((N1 \times 27^3) + (N2 \times 27^2) + (N3 \times 27))$
5. Use the letter-to-number assignments referred to above to convert N1 through N4 from a numeric value to its letter equivalent.

#### **1.4 Car Number**

The Car Number is encoded into the tag by converting the decimal value from 0 to 999999 to a binary value (a conversion from base 10 to base 2).

#### **1.5 Side Indicator Code**

The Side Indicator Code indicates whether the tag is installed on the left or right side of a railcar. The right or left side is in reference to a person facing the car from the handbrake end (B end) of the car. (See diagram, Exhibit A). The right side of the car is assigned a binary value 1 and left side of the car is assigned a binary value 0.

#### **1.6 Length**

The exterior length is measured as specified by the UMLER Data Specification Manual. To encode the data into the tag, the metric value from 0 to 4095 decimeters is converted to a base 2 equivalent value.

#### **1.7 Number of Axles**

This field indicates the number of axles on a car. To encode the Number of Axles into the tag, the decimal value from 1 to 32 is reduced by one and converted to base 2.

#### **1.8 Bearing Type Code**

To encode the Bearing Type Code into the tag, the decimal value of 0 through 7 must be converted to the equivalent base 2 value. Table D presents a description of each Bearing Type Code value.

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**Table D: Data Values for the Bearing Type Code**

<u>Value</u>	<u>Description</u>
0	Plain Bearings
1	Roller Bearings, Not Otherwise Classified
2	Roller Bearings, Inboard
3	Roller Bearings, 3 Axle Truck, 1 Axle Obstructed ("Buckeye Design")
4	Roller Bearings, Plain Bearing Housing
5	Roller Bearings, Cylindrical Oil Filled
6-7	Reserved

**1.9 Platform Identifier Code**

Table "E" presents the values assigned to each platform identifier code. Non-articulated or single unit cars shall be assigned the value 0. For multi-unit cars, "B" is assigned to the platform stenciled "B" and A is assigned to the extreme opposite platform. Platforms adjacent to the "B" platform are assigned "C", "D", "E", etc. in a sequential manner for consecutive platforms moving away from the "B" platform. To encode the Platform Identifier Code into the tag, the decimal value from 0 to 15 must be converted to its equivalent base 2 value.

**Table E: Data Values for the Platform Identifier Code**

<u>Value</u>	<u>Description</u>
0	Single Platform Car (Non-Articulated)
1	"A" Platform
2	"B" Platform
3	"C" Platform
4	"D" Platform
5	"E" Platform
6	"F" Platform
7	"G" Platform
8	"H" Platform
9	"I" Platform
10	"J" Platform
11	"K" Platform
12	"L" Platform
13	"M" Platform
14	"N" Platform
15	"O" Platform

**1.10 Spare #1**

This field can be used for any use by the Owner or it can be used to specify the first digit of the AAR Car Type Code. The AAR Car Type utilizes a letter character followed by three numerics; the information contained in the three numerics is described in Section 1.11. The Car Type values are encoded into the Tag by converting the decimal value from

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**Table F: Data Values for the First Position Of The AAR Car Type**

<b><u>Value</u></b>	<b><u>Symbol</u></b>	<b><u>Description</u></b>
0	A	Equipped Box Cars
1	B	Unequipped Box Cars
2	C	Covered Hopper Cars
3	D	Locomotive
4	E	Equipped Gondola
5	F	Flat Cars
6	G	Unequipped Gondola
7	H	Unequipped Hopper Cars
8	I	Spare
9	J	Gondola Car - GT
10	K	Equipped Hopper Cars
11	L	Special Type Cars
12	M	Maintenance of Way, Passenger, Caboose and End-of-Train Information Systems
13	N	Spare
14	O	Spare
15	P	Conventional Intermodal Flat Cars (FC)
16	Q	Light Weight, Low Profile, Single Platform (FC) Articulated Intermodal Cars (FCA)
17	R	Refrigerator Cars
18	S	Stack Car
19	T	Tank Cars
20	U	Containers
21	V	Vehicular Flat Cars (FA Only)
22	W	Spare
23	X	Spare
24	Y	Spare
25	Z	Trailers/Chassis
26-31		Spare

### 1.11 Spare #2

This field can be used for any use by the Owner or it can further supplement the Car Type information described in Section 1.10. If the field is used to further specify the Car Type, the last 3 digits of the AAR Car Type are entered into this field. These three numbers are encoded into the Tag by converting the decimal value from 0 to 999 into its base 2 equivalent.

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**Appendix B**

**TAG DATA FORMAT FOR THE LOCOMOTIVE**

**1.0 BITS AVAILABLE FOR GENERAL USE**

Fields specified by the Standard are listed in Table A; General Use fields are indicated in bold type. A description of each General Use field is presented in the paragraphs following Table A.

**Table A: Data Field Descriptions for the Locomotive Tag**

<b>Entry</b>	<b>Bits Required</b>	<b>Tag Data Sequence</b>	<b>Minimum Value</b>	<b>Maximum Value</b>	<b>Units</b>
Equipment Group Code	5	0-4	0	31	Type Code
Tag Type	2	5-6	1	4	Type Code
Equipment Initial (Mark)	19	7-25	A	ZZZZ	Alpha
Locomotive Number	20	26-45	0	999999	Numeric
Side Indicator Code	1	46	0	1	Side Code
Length	9	47-55	0	510	Decimeters
			[0	167	Feet]
Number of Axles	5	56-59,64	1	32	Axles
First Check Sum	2	60-61			
Reserved Frame Marker	2	62-63			
Bearing Type Code	3	65-67	0	7	Type Code
Spare	30	68-97	Available for Owner's Use - For Example Model Number		
Reserved	8	98-105	Reserved for Future Use by AAR		
Security	12	106-117	Reserved for Security or limited Owner's use		
Data Format Code	6	118-123			
Second Check Sum	2	124-125			
Frame Marker	2	126-127			

The fields are arranged in a hierarchical fashion in order to expedite processing by the data processor. It is intended that the data processor will first look at the Data Format Code to determine if the tag should be ignored. For example, in some cases the data processor will wish to ignore all tags except those specified as rail (AAR Standard) or marine intermodal (ISO Standard) tags.

Once the Data Format Code has been processed, then the data processor will look to the Tag Type to determine the configuration, capabilities, and memory capacity of the tag.

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Next, the data processor will examine the Equipment Group Code to determine if the tagged equipment is relevant. For example, the host may want to ignore or process differently, non-revenue equipment than it would railcars or locomotives.

The order in which the remaining fields are processed will be dictated by the particular application.

### **1.1 Equipment Group Code**

This is a numeric field having a value from 0 to 31 that indicates the general type of equipment. A table of values for this field is indicated below. Note that only major categories of equipment types are indicated in this field and other fields are allotted to indicate further details. The Equipment Group Code for a locomotive is decimal 5 (binary 00101).

**Table B: Data Values for the Equipment Group Code**

<u>Value</u>	<u>Description</u>	<u>Value</u>	<u>Description</u>
0	Other	16	Reserved
1	Reserved	17	Tractor (Power)
2	Reserved	18	Straight Truck
3	Reserved	19	Railcar
4	Reserved	20	Dolly
5	Locomotive	21	Trailer
6	End-of-Train Device	22	Reserved
7	Reserved	23	Reserved
8	Reserved	24	Reserved
9	Reserved	25	Reserved
10	Intermodal Container	26	Reserved
11	Reserved	27	Chassis
12	Reserved	28	Reserved
13	Reserved	29	Reserved
14	Non-Revenue Rail	30	Reserved
15	Reserved	31	Reserved

### **1.2 Tag Type**

The Tag Type indicates the configuration, capability, and memory size of the tag, as indicated in Table C.

**Table C: Data Values for the Tag Type Field**

<u>Decimal Value</u>	<u>Description</u>
1	Reserved
2	Tag described by this AAR Standard and the ISO Standard 10374
3	Multiple Frame Tag
4	Reserved

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To code the Tag Type value into the tag, the decimal value is reduced by one and converted to its base 2 equivalent.

### **1.3 Equipment Initial**

The Equipment Initial is composed of four (4) letters and can be represented as C1; C2; C3; C4. To code this information in the tag, the possible letters represented by C1 will be assigned to the following decimal values: A=0, B=1, C=2, ....Z=25. The letters C2, C3 and C4 will be assigned the following values: Blank =0, A=1, B=2, ...Z=26. This code assignment allows for an Initial of less than four characters, with the actual characters left justified, and the remainder of the field padded with blanks.

Conversion from alpha to numeric would involve the following:

1. Determine the numeric equivalent of characters C1 through C4. This will result in four numeric values; N1 through N4.
2. Convert N1 through N4 into one numeric value by using the formula:

$$\text{Value} = (N1 \times 27^3) + (N2 \times 27^2) + (N3 \times 27) + N4$$

The base 2 equivalent of the decimal number "Value" is stored in the tag's Equipment Initial field.

Conversion from a base 2 tag format back to the four letters would involve the following, where "Value" is the decimal equivalent of the base 2 value in the Equipment Initial field.

1.  $N1 = \text{Value} / 27^3$  (integer - drop fractions)
2.  $N2 = (\text{Value} - (N1 \times 27^3)) / 27^2$  (integer)
3.  $N3 = (\text{Value} - ((N1 \times 27^3) + (N2 \times 27^2))) / 27$  (integer)
4.  $N4 = \text{Value} - ((N1 \times 27^3) + (N2 \times 27^2) + (N3 \times 27))$
5. Use the letter-to-number assignments referred to above to convert N1 through N4 from a numeric value to its letter equivalent.

### **1.4 Locomotive Number**

The Locomotive Number is encoded into the tag by converting the decimal value from 0 to 999999 to a binary value (a conversion from base 10 to base 2).

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### **1.5 Side Indicator Code**

The Side Indicator Code indicates whether the tag is installed on the left or right side of a locomotive. The right or left side is in reference to a person facing the same direction as the F end of the locomotive (See diagrams, Exhibit A). The right side of the locomotive is assigned a binary value 1 and left side of the locomotive is assigned a binary value 0.

### **1.6 Length**

The exterior length is measured as specified by the UMLER Data Specification manual. To encode the data into the tag, the metric value from 0 to 510 is converted to a base 2 equivalent value.

### **1.7 Number of Axles**

This field indicates the number of axles on a locomotive. To encode the Number of Axles into the Tag, the decimal value from 1 to 32 is reduced by one and converted to base 2.

### **1.8 Bearing Type Code**

To encode the Bearing Type Code into the Tag, the decimal value of 0 through 7 must be converted to the equivalent base 2 value. Table D presents a description of each Bearing Type Code value.

**Table D: Data Values for the Bearing Type Code**

<b><u>Value</u></b>	<b><u>Description</u></b>
0	Plain Bearings
1	Roller Bearings, Not Otherwise Classified
2	Roller Bearings, Inboard
3	Roller Bearings, 3 Axle Truck, 1 Axle Obstructed ("Buckeye Design")
4	Roller Bearings, Plain Bearing Housing
5	Roller Bearings, Cylindrical Oil Filled
6-7	Reserved

### **1.9 Spare**

The Spare field is an optional area which can be used at the discretion of the Owner. For example, it can be used to indicate the Locomotive's model number. The model number is encoded into this field as 5 ASCII six-bit characters. The ASCII six-bit table is presented in Appendix H; the decimal value listed in the table must be converted to base 2 for Tag programming.



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**Appendix C**  
**TAG DATA FORMAT FOR TRAILERS**

**1.0 BITS AVAILABLE FOR GENERAL USE**

Fields specified by the Standard are listed in Table A; General Use fields are indicated in bold type. A description of each General Use field is presented in the paragraphs following Table A.

**Table A: Data Field Descriptions for the Trailer Tag**

<b>Entry</b>	<b>Bits Required</b>	<b>Tag Data Sequence</b>	<b>Minimum Value</b>	<b>Maximum Value</b>	<b>Units</b>
Equipment Group Code	5	0-4	0	31	Type Code
Tag Type	2	5-6	1	4	Type Code
Owner's Code (Initial) *	19	7-25	A	ZZZZ	Alpha
Trailer Number	42	26-59, 64-71	0	ZZZZZZZZ	Alpha Numeric
First Check Sum	2	60-61			
Reserved Frame Marker	2	62-63			
Length	11	72-82	0	2047	Centimeters
			[0	806	Inches]
Width	2	83-84	0	3	Width Code
Tandem Width	2	85-86	0	3	Code
Type Detail Code	4	87-90	0	15	Type Code
Forward Extension	8	91-98	30	284	Centimeters
			[12	112	Inches]
Tare Weight	7	99-105	15	141	100 Kg.
			[33	310	100 Pounds]
Height or Security	12	106-117	0	511	Centimeters
			[0	402	Half Inches]
Data Format Code	6	118-123			
Second Check Sum	2	124-125			
Frame Marker	2	126-127			

\* When the Owner's Code is not the same as the Trailer Initial (Mark), use the Trailer Initial (Mark) in this field.

The fields are arranged in a hierarchical fashion in order to expedite processing by the data processor. It is intended that the data processor will first look at the Data Format Code to determine if the tag should be ignored. For example, in some cases the data processor will wish to ignore all tags except those specified.

Once the Data Format Code has been processed, then the data processor will look to the Tag Type to determine the configuration, capabilities, and memory capacity of the tag.

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Next, the data processor will examine the Equipment Group Code to determine if the tagged equipment is relevant.

The order in which the remaining fields are processed will be dictated by the particular application.

### **1.1 Equipment Group Code**

This is a numeric field having a value from 0 to 31 that indicates the general type of equipment. A table of values for this field is indicated below. Note that only major categories of equipment types are indicated in this field and other fields are allotted to indicate further details. The Equipment Group Code for a trailer is a decimal 21 (binary 10101).

**Table B: Data Values for the Equipment Group Code**

<b><u>Value</u></b>	<b><u>Description</u></b>	<b><u>Value</u></b>	<b><u>Description</u></b>
0	Other	16	Reserved
1	Reserved	17	Tractor (Power)
2	Reserved	18	Straight Truck
3	Reserved	19	Railcar
4	Reserved	20	Dolly
5	Locomotive	21	Trailer
6	End-of-Train Device	22	Reserved
7	Reserved	23	Reserved
8	Reserved	24	Reserved
9	Reserved	25	Reserved
10	Intermodal Container	26	Reserved
11	Reserved	27	Chassis
12	Reserved	28	Reserved
13	Reserved	29	Reserved
14	Non-Revenue Rail	30	Reserved
15	Reserved	31	Reserved

### **1.2 Tag Type**

The Tag Type indicates the configuration, capability, and memory size of the Tag, as indicated in Table C.

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**Table C: Data Values for the Tag Type Field**

<u>Decimal Value</u>	<u>Description</u>
1	Reserved
2	Tag described by this AAR Standard
3	Multiple Frame Tag
4	Reserved

To code the Tag Type value into the Tag, the decimal value is reduced by one and converted to its base 2 equivalent.

### **1.3 Owner's Code/Trailer Mark**

The Owner's Code/Trailer Mark is composed of four (4) letters and can be represented as C1; C2; C3; C4. To code this information in the Tag, the possible letters represented by C1 will be assigned to the following decimal values: A=0, B=1, C=2, ...Z=25. The letters C2, C3 and C4 will be assigned the following values: Blank =0, A=1, B=2, ...Z=26. This code assignment allows for a Owner's Code of less than four characters, with the actual characters left justified, and the remainder of the field padded with blanks.

Conversion from alpha to numeric would involve the following:

1. Determine the numeric equivalent of characters C1 through C4. This will result in four numeric values; N1 through N4.
2. Convert N1 through N4 into one numeric value by using the formula:  
$$\text{Value} = (N1 \times 27^3) + (N2 \times 27^2) + (N3 \times 27) + N4$$

The base 2 equivalent of the decimal number "Value" is stored in the Tag's Owner's Code field.

Conversion from a base 2 tag format back to the four letters would involve the following, where "Value" is the decimal equivalent of the base 2 value in the Owner's Code field.

1.  $N1 = \text{Value} / 27^3$  (integer - drop fractions)
2.  $N2 = (\text{Value} - (N1 \times 27^3)) / 27^2$  (integer)
3.  $N3 = (\text{Value} - ((N1 \times 27^3) + (N2 \times 27^2))) / 27$  (integer)
4.  $N4 = \text{Value} - ((N1 \times 27^3) + (N2 \times 27^2) + (N3 \times 27))$

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5. Use the letter-to-number assignments referred to above to convert N1 through N4 from a numeric value to its letter equivalent.

**1.4 Trailer Number**

The Trailer Number consists of eight alphanumeric characters. Each character shall be assigned a numeric value as indicated below:

<u>Identification Character</u>	<u>Numeric Value</u>	<u>Identification Character</u>	<u>Numeric Value</u>
-(space)	0	H	18
0	1	I	19
1	2	J	20
2	3	K	21
3	4	L	22
4	5	M	23
5	6	N	24
6	7	O	25
7	8	P	26
8	9	Q	27
9	10	R	28
A	11	S	29
B	12	T	30
C	13	U	31
D	14	V	32
E	15	W	33
F	16	X	34
G	17	Y	35
		Z	36

The value associated with each character position will then form a base 37 number which is 8 digits long. The 8-digit number is encoded into the Tag by converting it to its base 2 equivalent.

**1.5 Length**

This field indicates the trailer length. The length field is equivalent to the overall (outside) length of the trailer, including forward protrusion but excluding dock bumpers. To encode the Length into the Tag, the metric value from 0 to 2047 is converted to its equivalent base 2 value. If a minimum binary value for this field is entered, it indicates a "does not apply" condition.

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**1.6 Width**

The trailer width is measured from the outside surfaces of the trailer. To encode the width into the Tag, use the following table:

**Width and Tandem Width Codes**

<u>Value</u>	<u>Description</u>
0	Not Used
1	96"/2.5 meters or less
2	More than 96"/2.5 meters but not more than 102"/2.6 meters
3	More than 102"/2.6 meters

The appropriate decimal value from the table is converted to its base 2 equivalent for encoding into the Tag.

**1.7 Tandem Width**

The Tandem Width indicates the nominal width of the trailer tandem, defined as the extreme width spanned by the outside tires of an axle. (The Tandem Width is usually 96 or 102 inches.) To encode the tandem width into the Tag, use the same procedure and table given for Width, above.

**1.8 Type Detail Code**

To encode the Type Detail Code into the Tag, the decimal value from 0 to 15 must be converted to the equivalent base 2 value. Table D presents a description of each type detail code value. The decimal value 15 represents no type code provided. [Rail compatible Trailers are trailers capable of operation on railroads without an underlying flatcar platform.]

**Table D: Data Values for the Type Detail Code**

<u>Value</u>	<u>Description</u>
0	Bulk Hopper or Tank
1	Mechanical Refrigerator-Underslung
2	General Service (non-equipped) Dry Van
3	Flat Bed (Including removable sides, platforms and expandables)
4	Open Top
5	Mechanical Refrigerator-Nose Mount
6	Rail Compatible Trailer, without Integral Rail Wheels
7	Insulated
8	Drop Frame (Including Wedge Frames)

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9	Special Equipped Straight Floor Closed
10	Rail Compatible Trailer, with Integral Rail Wheels
11-14	Reserved
15	Not Used

### **1.9 Forward Extension**

The Forward Extension field indicates the distance from the center of the kingpin to the most forward protrusion on the trailer. To encode the Forward Extension into the Tag, the metric value from 30 to 284 centimeters must be reduced by decimal 29, then converted to the equivalent base 2 value. If a minimum binary value for this field is entered, it indicates a "does not apply" condition.

### **1.10 Tare Weight**

This field indicates the trailer's empty weight in hundreds of kilograms or pounds. To encode the Tare Weight into the Tag, the metric value from 15 to 141 hundred kilograms must be reduced by decimal value 14, then converted to its equivalent base 2 value. If a minimum binary value for this field is entered, it indicates a "does not apply" condition.

### **1.11 Height**

The height of the trailer is indicated by this field, or the field may be used for security characters. If the user does not wish to use security nor indicate the trailer height, then this field shall be filled with binary zeros. The Height field is equivalent to the overall (outside) height of the trailer measured vertically from the ground to the top of the trailer at the rear axle position, with the trailer in an unloaded condition and with properly inflated tires. To encode the height into the tag, use the subsequent steps to encode the data. (If inches are entered, the programmer hardware will perform the necessary conversion.)

1. Convert the trailer height decimal value (centimeters) ( $D_2D_1D_0$ ) to a base 37 number ( $T_1T_0$ ) as follows:

$$C = D_2D_1D_0/37 \text{ (Truncate to an Integer Result)}$$

$$T_1 = C + 1$$

$$T_0 = D_2D_1D_0 - (C \times 37) \text{ (Truncate to an Integer Result)}$$

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2. Use the following table to convert  $T_1T_0$  to two alpha-numeric symbols ( $A_1A_0$ )

<u><math>A_1</math> or <math>A_0</math></u>	<u><math>T_1</math> or <math>T_0</math></u>	<u><math>A_1</math> or <math>A_0</math></u>	<u><math>T_1</math> or <math>T_0</math></u>
<u>Character</u>	<u>Value</u>	<u>Character</u>	<u>Value</u>
/(slash)	0	H	18
0	1	I	19
1	2	J	20
2	3	K	21
3	4	L	22
4	5	M	23
5	6	N	24
6	7	O	25
7	8	P	26
8	9	Q	27
9	10	R	28
A	11	S	29
B	12	T	30
C	13	U	31
D	14	V	32
E	15	W	33
F	16	X	34
G	17	Y	35
		Z	36

3. Using the 6-Bit ASCII table presented in Appendix H, find the decimal values associated with the  $A_1$  character and the  $A_0$  character. Finally, these decimal values must then be converted to corresponding base 2 values.

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**Appendix D**

**TAG DATA FORMAT FOR CHASSIS**

**1.0 BITS AVAILABLE FOR GENERAL USE**

Fields specified by the Standard are listed in Table A; General Use fields are indicated in bold type. A description of each General Use field is presented in the paragraphs following Table A.

**Table A: Data Field Descriptions for the Chassis Tag**

<b>Entry</b>	<b>Bits Required</b>	<b>Tag Data Sequence</b>	<b>Minimum Value</b>	<b>Maximum Value</b>	<b>Units</b>
Equipment Group Code	5	0-4	0	31	Type Code
Tag Type	2	5-6	1	4	Type Code
Chassis Mark (Initial)	19	7-25	A	ZZZZ	Alpha
Chassis Number	20	26-45	0	999999	Numeric
Type Detail Code	4	46-49	0	15	Types
Tare Weight	6	50-55	15 [33	77 170	Hundred Kg Hundred Lbs]
First Check Sum	2	60-61			
Framing Bits	2	62-63			
Height	7	56-59,64-66	40 [32	166 130	Centimeters Half Inches]
Tandem Width Code	2	67-68	0	3	Code
Forward Extension	6	69-74	30 [12	154 61	Centimeters Inches]
Kingpin Setting	6	75-80	30 [12	154 61	Centimeters Inches]
Axle Spacing	5	81-85	10 [39	40 157	Decimeters Inches]
Running Gear Location	5	86-90	13 [51	43 169	Decimeters Inches]
Number of Lengths	3	91-93	0	7	Numeric
Minimum Length	10	94-103	0 [0	2046 806	Centimeters Inches]
Spare	2	104-105			Reserved
Maximum Length or Security	12	106-117	Length-Centimeters/See Table		
Data Format Code	6	118-123			
Second Check Sum	2	124-125			
Frame Marker	2	126-127			



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The fields are arranged in a hierarchical fashion in order to expedite processing by the data processor. It is intended that the data processor will first look at the Data Format Code to determine if the tag should be ignored. For example, in some cases the data processor will wish to ignore all tags except those specified.

Once the Data Format Code has been processed, then the data processor will look to the Tag Type to determine the configuration, capabilities, and memory capacity of the current Tag. This field is reserved for future use in the event that new types of Tags are developed which have different memory or communication capabilities.

Next, the data processor will examine the Equipment Group Code to determine if the tagged equipment is relevant. The order in which the remaining fields are processed will be dictated by the particular application.

### **1.1 Equipment Group Code**

This is a numeric field having a value from 0 to 31 that indicates the general type of equipment. A proposed table of values for this field is indicated below. Note that only major categories of equipment types are indicated in this field and other fields are allotted to indicate further details. The Equipment Group Code for a chassis is decimal 27 (binary 11011).

**Table B: Data Values for the Equipment Group Code**

<u>Value</u>	<u>Description</u>	<u>Value</u>	<u>Description</u>
0	Other	16	Reserved
1	Reserved	17	Tractor (Power)
2	Reserved	18	Straight Truck
3	Reserved	19	Railcar
4	Reserved	20	Dolly
5	Locomotive	21	Trailer
6	End-of-Train Device	22	Reserved
7	Reserved	23	Reserved
8	Reserved	24	Reserved
9	Reserved	25	Reserved
10	Intermodal Container	26	Reserved
11	Reserved	27	Chassis
12	Reserved	28	Reserved
13	Reserved	29	Reserved
14	Non-Revenue Rail	30	Reserved
15	Reserved	31	Reserved

### **1.2 Tag Type**

The Tag Type indicates the configuration, capability, and memory size of the Tag, as indicated in Table C.